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ABSTRACT

Findings from four lines of inquiry that attempt to identify teaching skills are reviewed. Following a brief introduction, the first section discusses definitions of "skill" and outlines empirical attributes of teaching skills. In the following section, the four lines of inquiry are described. Results are analyzed in the third section. First, naturalistic studies--analyzing teaching and instructional management in "regular" classrooms, and often deriving experimental models of effective teaching--are reviewed. Second, theory-driven studies--positing particular educational environments as affecting specific types of learning and analyzing the skills used to create such environments--are examined in four subcategories: social models, involving group inquiry by students; information-processing models, emphasizing techniques designed to improve cognition; student-centered models; and behavioral models. Third, examples of curriculum research are reviewed. This research asks whether there are reproducible techniques for producing curricula that affect learning, and whether schools can foster sufficient stability for these curricula to succeed. Finally, effective schools research is considered; it inquires into what types of school environment benefit learning, and how educators produce such environments. The final section briefly summarizes the findings of all four research avenues, assesses their value, and suggests an integrative framework. An extensive bibliography is included. (MCG)

Research-Based Teaching Skills: What Is in the Storehouse?

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Executive Summary

The purpose of this project is to assess the state of knowledge about the skills that contribute to effective teaching in secondary schools. Four lines of research were reviewed: naturalistic studies of teaching, theory-driven studies of teaching, studies of curriculum, and studies of effective schools. Nearly 2,000 reports and reviews were consulted. The several hundred on which this report is based have in common their relevance to the question: Are there research-validated skills for secondary teachers?

Underlying this question is the issue of whether preservice teacher education programs, staff development programs, and school improvement efforts can reliably draw on research for the identification of teaching skills that can be the focus of those programs.

The answer is yes. All the lines of research have generated an information base that can be drawn on as training programs are developed. Naturalistic studies of teaching have identified management practices that improve student learning. Studies of effective schools have identified school climate variables that influence student achievement. Theory-driven studies of teaching have identified a range of teaching strategies that, when properly used, can improve student learning in a variety of areas. Curriculum research has demonstrated that effective curricula can be developed and, when properly implemented, can increase student learning in many settings. Studies of innovation and training have provided the technology for educating teachers to use the results of all these avenues of research.

The nature of effective teaching skills varies widely. Some are "good practices" that can be implemented without special training and practice. Others require intensive training and practice before the teacher

can acquire and employ them effectively. However, greater provisions for human resource development in education will be necessary before teachers begin to acquire these specialized skills on a widespread basis.

Still, the picture is optimistic. Teaching can be made much more effective by the application of research to training, and school improvement programs can be oriented at least partly to research findings. Training procedures have been developed that enable teachers and administrators to acquire even the very complex skills necessary for effective teaching.

Introduction

The concept of validated teaching skills defines one of the most promising areas for bringing educational research and practice together. If research can identify effective teaching skills and these skills can then be incorporated as the objectives of preservice and inservice teacher education programs, the distance between the activities of practitioners and scholars can be greatly reduced (Gage 1979; Medley 1977).

The findings from four distinct lines of inquiry have accumulated to a point where we can assess the evidence and begin to organize the results in a form useful for program planning.

The four lines of inquiry are:

Naturalistic studies of teaching

Theory-driven experimental studies of teaching

Studies of curriculum and curriculum implementation

Studies of effective schools

Although the findings from these four lines of inquiry have previously been described separately, they have never been analyzed and integrated as a whole; hence, we attempted to analyze the findings in each area and to compare and integrate the findings. In this paper we present the results of that analysis and suggest a framework for organizing and integrating the various effective teaching skills into the design of preservice and inservice programs and school improvement efforts.

During our review, we became convinced that integrating the substantial body of research from the four lines of inquiry increases not only the number of findings but also increases their potential power, for the findings from one area are often extended and buttressed by research from another. Integrating the findings also broadens the concept of teaching

skill because each area of research illuminates different aspects of a teacher's work. Each line of inquiry offers something to the others, both conceptually and methodologically.

The paper is organized into four sections. The first section discusses the concept of skill. The second describes each line of study. The third section discusses the findings in each area, and the concluding section presents a framework for accumulating the findings for use in program planning.

The Concept of Skill

Definitions

"Skill" denotes and connotes a variety of meanings in both colloquial and professional contexts. Even dictionary definitions, which often exclude colloquial meanings, illustrate the variety. The New Webster's Dictionary (1981) emphasizes that skill is not simply the "ordinary" production of behavior. According to that dictionary, special training or attention is required. The New Oxford Illustrated Dictionary (1978) emphasizes expertness and also includes the component of training or practice. The assumption is that ordinary life experience does not produce the skill; rather, skill is acquired through special practice or training. The Collins Standard Dictionary (1978) lays stress on greatness of ability. A behavior that anyone could do is not defined as a skill. Webster's New Collegiate Dictionary (1975) emphasizes that a skill must be acquired by practice and used appropriately for an end, including the intentional application of knowledge. It defines "skill" as "the ability to use one's knowledge effectively and readily in execution or performance" and as "a learned power of doing something competently: a developed aptitude or ability."

Attributes

As we studied the literature we were impressed with the variety of attributes associated with effective teaching skills. In this section we will consider several of the recurrent attributes and dimensions of the skills that have been described in the research.

Intentionality. The attribute of intentionality--doing something because it is believed that it will make a difference--is common to all the skills.

Ordinariness/expertness. Some effective practices are ordinary behaviors that need only be produced to get results. The cluster of behaviors related to assigning homework is an example. Other practices, such as the use of cooperative investigation in the classroom or the management of scientific inquiry, require a deftness that is developed only through arduous training and practice.

Action. All the behaviors identified in the research are actions. In terms of current philosophical discussions, "knowledge about" the skill is not sufficient. To be classified as a teaching skill, knowledge has to be coupled with action. However, some teaching skills are intellectual in nature; the amount of cognitive activity required far exceeds the visible teaching behavior. According to Gagne (1965), teaching skill is demonstrated when a teacher uses rules and, more frequently, problem-solving techniques, to accomplish a desired end.

Teaching is an activity based on a complicatd relationship between the production of behaviors and their effects on students. This contrasts with activities where a purely mechanical relationship exists between a person and a physical object. For example, "hammering" requires only that the "hammerer" take into account the physics of the body, the hammer, and the nail in order to achieve a fairly predictable result--that the nail will be driven. Teaching, of course, is based on a much more complex relationship involving two humans--the teacher and the learner--and cannot be reduced to a mechanical process applied to such activities as hammering.

Environment and learner. Teaching affects learning, but it is the learner's effort that produces the learning. From a measurement perspective we can see this in the variance, frequently more than 75 percent, attributable to learner characteristics. Dewey (1916, 1938) formulated the idea that learning is the product of the interaction between the learner and

the environment; this continues to be a useful concept as we try to come to grips with the nature of teaching skill. The teacher can manipulate the environment in which the student learns. The relationship between the skill that affects the environment and the actual learning that takes place must be expressed in probabilistic terms. This relationship involves more than differences in individual responses to environments. It involves the nature of the teacher/learner relationship itself. Teachers can use skills to affect the environment with the expectation that they will increase the probability that the learner will be activated and that learning will take place. This creates interesting problems for the researcher, who ferrets out the nature of the relationships, and an equally interesting problem for the practitioner, who seeks to understand and use the results. The language in which researchers express their findings and in which practitioners receive the findings must be chosen carefully. If either a researcher uses or a practitioner expects language that would be more appropriate for acquiring skills for hammering than for effective teaching, the researcher will give the wrong impression and the practitioner will be disappointed with the results.

Context. Teaching takes place in a variety of contexts, and context may influence how skills contribute to learning; for example, what works very well in a tutorial center in a resource-based instructional system may not work well in a typical classroom setting. Also, wherever technology is a component of the educational environment, the designers and producers of the technology may also be teachers; their skills may interact with those of the on-site training agent and alter the impact of skills. Even within the same context, skills may be transformed by the use of different instructional modes. What works in a discussion may not facilitate learning in a lecture or tutorial.

Setting. The criteria by which we judge a skill can also be altered by changes in the setting. Concrete illustrations abound in sports. Imagine, for example, a basketball player who has learned to produce a jump shot in a gymnasium. The player can dribble, turn, jump, shoot, and make three-fourths of the shots taken from fifteen feet. If we alter the setting by introducing an opponent, the player will no longer be able to move unimpeded, but must learn to evade and fake. To further complicate the problem, we can introduce the rest of the two teams. Our player's jump shot now is embedded in a matrix of skills that other players also possess. In the altered setting, the player may not be able to use the jump shot. The skill remains, but only as a potential skill.

The analogy is appropriate to teaching. In teaching, as in athletics, certain skills may only be effective if they can be modulated to fit circumstances. The shifting scene of students, group dynamics, materials, and other aspects of the environment all help determine the effects of specific teaching skills.

External/internal. In colloquial use, the term "skill" often conjures up images of physical activity. Many researchers have concentrated on the physical, observable acts of teaching; increasingly, however, they are studying the mental and emotional components of skill. Some behaviors may be effective when they are produced routinely. Others may require considerable thought before they are produced or intensive thought as they are being carried out. At one extreme is Schwab's (1965) suggestion that to be a fully effective biology teacher one must continually engage in at least informal research in the field. Otherwise one loses touch with the process itself, the communication of which lies at the heart of scientific inquiry. The ability to produce a behavior appropriately, or in some cases to produce it at all, my depend on substantial mental activities that contribute to the

physical skills of teaching.

Quality and good practice. What level of skill is necessary to contribute to the educational environment? Simple production may be adequate in some cases. In others, expertise may be critical. Basketball players must be able to hold the ball deftly, exercise a high degree of muscle control, and shoot the ball in the basket. However, to get in position to shoot, quickness alone may be sufficient. As another example, a physician may get results by daubing ointment on an inflamed area, providing no more care than his patient is capable of providing. In fact, he may simply hand the ointment to the patient for self-application. In contrast, laser surgery of the retina can be successful only with careful, precise movement.

Should routinely produced but effective behavior be classified as skill? Perhaps the phrase "good practice" is better. Some routinely produced practices may be very important. In surgery, sterile techniques are not hard to practice, but they are essential for preserving life. Similarly, in a classroom setting the arrangement of instructional materials so that they are easily accessible may be a simple task, but failure to do so may severely impair learning.

Time. What is the appropriate length of time that learners should be exposed to various teaching behaviors? Because repeated exposure for short increments of time may pay off handsomely in the long run, there is no reason to be devoted exclusively to the quick pay-off derived from lengthy exposure. However, the relationship of time to efficiency must remain a consideration in the educational setting.

Objectives. There are so many educational objectives that we usually take for granted that some skills may be appropriate only for certain objectives. Yet, the literature is still replete with talk of "effective teaching" as if that were a process of acquiring a series of skills and then

applying them to a wide spectrum of learning objectives. This is probably not the case.

At this point we discourage the armchair development of criteria which define a behavior as a skill. Research findings identify some good practices that are easy to produce, some behaviors that require extensive practice and training, some that can be applied routinely, and some that require considerable intellectual activity. Some have subtle, long-term effects and others have dramatic, immediate effects. Our strategy is to examine the accumulated findings and build definitions slowly.

The Four Lines of Inquiry into Teaching

Each of the four lines of inquiry represents a school of thought about what constitutes effective teaching. Although each begins from a somewhat different position, employs a somewhat different paradigm and methodology, and frames its findings differently, each type of research contributes distinctively to the common purpose of identifying the elements that contribute to effective teaching.

Naturalistic Studies of Teaching

The Anderson-Brewer (1946) studies ushered in the modern era of investigations that employ a paradigm in which relatively low-inference descriptions of teacher behavior (process) are collected and correlated with a measure of desired student behavior (product). Over the years, many frames of reference have been used to describe teacher-student interaction, and these frames of reference include many types of student learning (Flanders 1970; Medley and Mitzel 1963; Rosenshine 1971; Spaulding 1970; Stallings, Needels, and Stayrook 1979). What distinguishes this research from other studies of teaching, however, is the focus on naturally occurring classroom behaviors.

The research begins with the measurement of student academic achievement or other indicators of student learning. Data are accumulated by class, and teachers are selected for study according to the achievement or response level of their students. The researcher may select teachers whose students are at the high, middle, or low sectors of the distribution. An alternative is to study a fairly large sample of teachers and expect that variation in student achievement will occur naturally. The next step is to study the behavior of teachers and/or students in their natural habitat--the classroom--and to measure that behavior with low-inference instruments.

Classrooms manifesting different levels of achievement are then compared, and different frequencies of teacher and student behavior are correlated with the measures of learning.

The findings emerge from this analysis. If the findings identify teacher behaviors that appear to differentiate levels of student learning, the investigators may then proceed, as did Good and Grouws (1977) and Stallings, Needels, and Stayrook (1979), to an experimental mode. Teacher behaviors associated with higher student achievement rates are then taught to teachers whose students typically manifest low or moderate achievement. This helps determine whether or not a teacher's ability to acquire and manifest the behaviors raises student learning. If the results of the experimental phase are positive, the teacher behaviors that differentiate the more effective teachers from the less effective teachers qualify as candidates for "teachable teaching skills."

Naturalistic studies can be difficult to carry out, especially if the investigator seeks to develop a sample based strictly on student achievement in classrooms across a large geographical area. These studies require access to teachers and students, and extensive classroom observation is necessary. If the researcher selects teachers on the basis of stability of effects, the number of teachers available for study can be greatly reduced (Weil et al. 1984). In fact, the problem of stability of effectiveness (Brophy and Evertson 1974) and stability of behavior (Shavelson and Dempsey 1976) has been vexing. From the standpoint of management, successful research often requires classroom observation of very ineffective teachers, many of whom may experience acute discipline problems. The incidence of discipline problems also confronts the researcher with the difficulty of differentiating those aspects of teacher behavior related to the discipline problems from those associated with the effectiveness of instruction per se. However, the

paradigm for the research is straightforward and provides a relatively clear path to the findings. The difficulties have not prevented energetic and well-organized researchers from successfully carrying out large, complex studies.

Theory-Driven Studies

From psychology, social psychology, philosophy, therapy, and other disciplines have come experiments designed to learn whether theoretically derived patterns of teaching produce the distinctive effects for which they were designed (Joyce and Weil 1980). Many theory-driven studies employ methods used in naturalistic studies, but the research paradigm is usually experimental, although the treatment is sometimes studied as it occurs naturally. What distinguishes theory-driven research from naturalistic studies of teaching, however, is not so much the methodology employed as the belief that the creation and investigation of specific forms of teaching will result in theoretically relevant outcomes of a kind and/or magnitude that are unlikely to occur naturally in the classroom.

The theory-driven line of inquiry generally begins with a thesis that describes an educational environment, its presumed effects, and a rationale that links the environment and its intended effects. Theories vary greatly in compexity and in the number of variables they include. For example, some theories include treatises on the nature of the academic disciplines, and others describe provisions for adjusting instruction to one or more characteristics of the learner (Harvey, Hunt, and Schroeder 1961). The description of the environment is sometimes suitable for brief instructional episodes, but at other times the approach is broadly prescriptive and implementable only as a pervasive approach to teaching. In addition, many studies describe emergent environments, that is, environments that develop

when learners respond to stimuli and when students are regarded as partners in the educational enterprise (Joyce and Weil 1980).

Because researchers conducting theory-driven studies expect to change existing behaviors or to generate new ones, the first step they often take is to collect baseline data. After the researchers observe natural teaching behavior, they train teachers to use the new teaching behaviors. Implementation of the new behavior is monitored, either in the regular classroom or in a laboratory setting, and theory-relevant student behaviors or outcomes are measured. Experimental classrooms are often compared with "traditional" classrooms to determine the presence, direction, and magnitude of change. In a very few studies, combinations of theories have been intensively employed in an attempt to influence intelligence and personality (Spaulding 1970).

Whereas the naturalistic studies allow teachers to generate the environments that will be studied for possible relationships to student learning, theory-based approaches require that teachers be trained to produce the environments to be tested. Since nearly all teachers use recitation as the primary mode of teaching (Goodlad 1983; Goodlad and Klein 1970; Hoetker and Ahlbrand 1969; Sirotnik 1983), training in new strategies must often be intensive. Thus, many tests of the theoretical approaches are made in experiments where teachers generate environments unfamiliar to them. Recent research has shown that integrating new methods of instruction into a teacher's repertoire is an arduous and complex process (Fullan 1982; Fullan and Pomfret 1977; Joyce and Showers 1983). Therefore, some of the tests of theory-based models are questionable because teachers received relatively weak training for acquiring new behaviors.

Curriculum Studies

In the academic reform movement of the 1950s and 1960s, some entirely revised curricula were developed and introduced into schools. These curricula in subjects such as science, social studies (e.g., MACOS), mathematics (e.g., School Mathematics Study Group), and language (e.g., the linguistic approaches) were based on the belief that students should study an academic subject by using the methodologies employed in that discipline. Therefore, most of these curricula required students to learn the modes of inquiry employed by the discipline as well as the factual material related to it. Process was valued equally with content, and many of these curricula became characterized as "inquiry oriented." In addition, general approaches to early childhood education (e.g., Headstart and Follow Through), the education of older children (Distar), studies of curricula mediated through television and other media, and computer-mediated and computer-assisted curricula all make their contribution to curriculum research, even though some of them investigate the role of the human training agent in settings other than the classroom.

Much curriculum research resembles the experimental studies of teaching, but the unit under study is a configuration of content, teaching methods, instructional materials and technologies, and organizational forms. In the experiments, any one of the elements of curriculum may be studied separately or in combination with the others, and the results are expressed in terms of whether or not a curriculum produces predicted effects. The relevance of curriculum research to teaching is that many curricular events are embodied in or mediated by teacher behavior and thus may be expressed in terms of teaching skill.

Although curriculum studies are similar to theory-driven research,

baseline data are not generally collected on teacher behavior. The amount of training given has varied widely. At its weakest, training may consist of the introduction of new materials into the classroom. In the better studies, implementation is monitored, either by classroom observation or interviews. Effects are determined by comparing student outcomes in experimental and control classrooms. In a few studies (Almy 1970) combinations of curricula are employed to determine effects on cognitive development and intelligence.

Studies of Effective Schools

Research that compares schools has gone on for some time. Until 20 years ago, however, most of it was theory-directed. For example, 40 years ago the beautifully designed "eight-year" study (Chamberlin and Chamberlin 1942) submitted the theses of the Progressive Movement to a careful (and generally successful) test and defended it against the suggestion that social and personal models of education were dangerous to students' academic health. Twenty years ago, the study by Coleman et al. (1966) ushered in an era of investigations that still continues, with the focus on naturalistic studies similar to the process-product orientation that directs naturalistic studies of teaching. Recent research on school effects (Brookover et al. 1978; Edmonds 1979; Rutter et al. 1979) has called into question the findings of the Coleman study and advanced the methodology for studying schools. Ralphy and Fennessey (1982); Rowan, Bossert, and Dwyer (1983); and Purkey and Smith (1983) have continued this work, noting that the initial studies concentrated on comparisons between the extremes of a distribution and cautioning that correlation does not necessarily imply causation.

Research on effective schools is fueled by the belief that educational goals are achieved as much by the organizational settings in which learning occurs as by the quality of specific curricula and individual

teachers. The research paradigm generally employed is similar in structure to the naturalistic studies of effective teaching practice, although the unit here is the school. The focus is on the social organization of the school, and curricular and instructional practices are described more globally than in the studies of curriculum and individual classrooms. Because many of these aspects of schooling are influenced by the behavior of teachers and administrators, the results may be expressed at least partially in terms of teaching skill or behavior.

Schools are first differentiated on a criterion of effectiveness, which is generally based on the level of academic achievement as measured by student performance on commercially available tests administered on a widespread basis. The researcher studies the schools and attempts to find out what accounts for the differences in productivity. Currently this work is evolving toward attempts to find causal connections by changing the school environment and trying to learn whether the changes are accompanied by changes in student achievement.

Several difficulties confront researchers studying schools for their effects on students. Little is known about the stability of either effectiveness or environments. Instrumentation is difficult, and the logistics are even more complicated than those in the naturalistic study of the classroom as a unit. However, recent investigations (e.g., Weil et al. 1984) have tried to overcome these problems by comparing schools that have been unusually effective for several years with schools that are more "typical," and by improving the reliability of instruments. The findings from this line of inquiry are still the "softest," but we can expect improvement; and the incorporation of theoretical lines relevant to the social dimensions of education should sharpen the focus of the methodology used in this area.

The Results

As we turn to the results of the search, we find that the complicated sets of literature have generated quite diverse findings. Furthermore, our search for "good practices" reveals that some skills apply primarily to distinct dimensions of the educational environment: the social climate of the school, the instructional process, the curriculum, and the management of instruction. Predictably, some of the practices can be employed with minimal training while others can be acquired only with arduous training and practice. Also, some require extensive knowledge before teachers can begin to use them appropriately.

Naturalistic Studies

The findings from naturalistic research on teaching are based on "what teachers do" in "regular" classrooms. Many of the studies focus on the management of instruction (what teachers do to prevent discipline problems and how they respond to them when they do occur, the arrangement and organization of materials, and the time allotted to various activities and subjects) as much as on the means of instruction (the kinds of information provided, the kinds of questions asked, and the types of activities provided). The patterns of management and teaching employed by more successful teachers, that is, by teachers whose students score higher on standardized achievement tests, are often collected into prescriptions or treatments and tested in experimental studies of teaching effectiveness.

The early, large-scale naturalistic studies were conducted in low SES, primary classrooms (Stallings and Kaskowitz 1974; Soar 1973) and elementary classrooms (Good and Grouws; 1977; Anderson, Evertson, and Brophy 1979; Fisher et al. 1980; McDonald and Elias 1976). Later work was extended to junior high schools (Emmer and Evertson 1980) and high schools (Stallings,

Needels, and Stayrook 1979).

The effective teacher behaviors, practices, and skills identified in naturalistic studies of teaching generally related more to the management of instruction than to actual teaching behaviors. Several studies (Brophy and Evertson 1974; Good and Grouws 1977; Fisher et al. 1980; Soar 1973; Stallings and Kaskowitz 1974) recommended such teaching practices as teaching students in large groups, allocating time to academic tasks, maintaining highly structured learning environments that reduce student off-task behaviors, supervising or monitoring seatwork, and assigning homework on a regular basis.

The consistency of results for teacher practices with young, low SES students is striking. In her correlational study of Follow Through first- and third-grade classrooms, Stallings (1975) found that higher reading and math, scores were associated with structured, systematic instruction patterns, e.g., longer amounts of time spent on reading and math and direct instruction from the teacher, accompanied by praise and/or feedback. More flexible, less structured classrooms had lower scores in reading and math, although students in those classrooms had higher attendance rates, exhibited more independence, scored higher on problem-solving tests, and were more likely to take responsibility for the quality of their performance. Flexible, or "open," classrooms were characterized by less direct instruction from teachers. Teachers in these classrooms spent greater amounts of time organizing the instructional environment with which students interacted and interacting with children on a one-to-one basis.

In a parallel study of Follow Through kindergarten and first-grade classrooms, Soar (1973) examined teacher behaviors with two types of student learning, which he called complex-abstract and simple-concrete. Simple-concrete gains were positively associated with the amount of teachers'

direct time on academic activities; the use of direct, focused questions in the classroom; large-group instruction; initiation of verbal interactions; and praise and positive feedback. Soar also noted, however, a curvilinear relationship between teacher behavior and types of learning outcomes. He found that moderately high levels of freedom facilitated complex growth while greater teacher direction increased simple learning. Both Soar and Stallings conducted extensive classroom observations with quite different observation instruments, yet their findings were remarkably similar.

Although McDonald and Elias (1976) reported mixed results from their Beginning Teacher Evaluation Study (BTES): Phase II, the BTES: Phase III by Fisher et al. (1980) replicated Stallings' and Soar's Follow Through findings in grades two and five. Teacher behaviors or practices associated with greater student achievement in reading and math included teacher accuracy in diagnosis, prescription of tasks related to students' achievement level, substantive (academic) interaction with students, academic feedback, structuring, and clear directions.

The convergence of results among these studies and others led to experimental research on the effects of the identified teacher practices on student achievement in reading and mathematics. Two examples of this experimental work are the study by Anderson, Evertson, and Brophy (1979) in first-grade reading and the study by Good and Grouws (1977) in fourth-grade math.

Anderson, Evertson, and Brophy (1979) conducted their experimental study in first-grade reading over a period of months and used middle-class students. A manual describing 22 principles of instruction thought to be effective for small-group instruction in the early grades was distributed to the 17 treatment teachers. The principles dealt with management of the group as a whole and with the feedback teachers gave to students' answers. The

manual was described to teachers as a "set of guidelines for teacher management of reading group instruction" (p. 195). No additional training was given to the experimental group.

Mean reading scores at the end of the experiment for the observed and unobserved treatment groups were 57.09 and 59.81, respectively, as compared with a mean score of 50.90 for the control groups. The superior performance of treatment teachers' students was attributed to teacher process variables, some of which were included in the experimental treatment (e.g., employing efficient transitions, arranging appropriate seating, using overviews, minimizing choral responses, using ordered turns to select respondents, and using specific praise in moderation). Practices most likely to be implemented were those that "specifically described the skills, . . . focused on behaviors that were familiar to the teachers, . . . and had a rationale based on other classroom processes or student outcomes that made sense to teachers" (p. 219).

Good the Grouws (1977) conducted their experiment in the teaching of fourth-grade mathematics with relatively low SES students. Twenty-one treatment teachers read a manual which described such treatment practices as daily review, development of new content, seatwork, and homework. Two 90-minute sessions were held with teachers to insure that they understood the recommended practices. Implementation by treatment teachers was high, with the exception of the "development" behavior advocated for 20 minutes per day. At the end of the two-and-one-half-month experiment, experimental teachers' students performed significantly better than control teachers' students on math computation, and the two groups showed no differences in solving math problems.

In terms of our dictionary definitions of skill, many of the teacher behaviors identified as effective in the naturalistic studies share the

attribute of intentionality but do not require extensive training or development for performance. Researchers who have conducted naturalistic studies of teaching and then followed them with experimental studies of the behaviors identified have, in fact, found that minimal training was required for teachers to use the advocated practices. Although the Stallings, Needels, and Stayrook (1979) experiment with secondary teachers is an exception, treatments have often been simple: teachers are given a manual which contains an explanation of the desired behaviors and, in some cases, a brief discussion of those behaviors (e.g., Good and Grouws 1977; Stanford Program on Teaching Effectiveness 1976). The ease of instructing teachers in the use of these behaviors should not be surprising, however, when we consider that the behaviors were first identified among the practices used by many teachers under usual classroom conditions. It is encouraging that only a relatively small amount of effort is required to enable teachers to use their existing skills regularly and appropriately. Further research is necessary to test the generalizability of these findings to older and higher SES students in areas other than reading and math. Some work in this area has already begun, and it has yielded promising results with older students.

The naturalistic study of teaching has provided a rich storehouse of effective practices for the management of instruction and student behavior and has demonstrated the relative ease of instructing teachers to use these practices. Combining the work of researchers using the naturalistic approach with that of the theory-based instruction researchers, who have concentrated heavily on the process and content of instruction for multiple purposes, may produce some very valuable findings.

Theory-Driven Studies

The theory-driven lines of inquiry investigate the theses that particular educational environments will have certain effects on specific types of learning. Teaching skills are identified as the environment is created in laboratory or field settings. Researchers then determine how well the skills can be taught to practitioners and whether the effects approximate those in the controlled tests.

In this section of the paper we will follow the framework used by Joyce and Weil (1980), in which 20 theoretical models of teaching are categorized into 4 families (social, information processing, personal, and behavioral). We will examine research on several of these models of teaching in an effort to discover what kind of teaching skills are required to implement them and how much they affect student achievement.

In some cases, single models have been studied several hundred times. There are numerous reviews of research, including about 20 meta-analyses of theory-driven research. To complicate matters further, there is relatively little cross-theory research, making a synthesis arduous. However, the effort is rewarding.

The skills involved in using most of the theory-driven models are complex. In most cases the intellective component is fairly substantial: the teacher needs to master the theory of the model and learn to apply it to academic substance and instructional materials. It is also necessary to acquire sets of behaviors that create a social system appropriate to the model, induce the students to engage in the model's cognitive and social tasks, and modulate those according to students' responses.

Considering the theory-driven line as a whole, we examine a series of literatures and ask whether this genre of work is a justifiable source of

teaching skills. Have effective teaching strategies emerged, what is the nature of the skills, and can teachers learn to use them? We will concentrate on a few quite different models as illustrations. The depth of the data base varies widely because it depends on the researchers' funding, the development of relevant technologies, and the length of time the approach sustained its popularity. The models differ in their purposes. In some cases researchers have concentrated on specific, "model-relevant" outcomes, whereas in other cases a broad spectrum of school outcomes has been examined.

Social Models

Group investigation is representative of the social models of teaching. It begins as a confrontation with a puzzling situation. Students react to the situation and examine the nature of their shared and differing reactions. They determine what information they need to approach the problem and then proceed to collect relevant data. They generate hypotheses and gather the information needed to test them. They evaluate their products and continue their inquiry or begin a new line of inquiry (Sharan 1980).

The teaching skills necessary for this model are those that build a cooperative social environment and teach students the skills of negotiation and conflict resolution that leads to democratic problem solving. In addition, the teacher needs to guide students in methods of data collection and analysis, help them frame testable hypotheses, and help them decide what would constitute a reasonable test of a hypothesis. Because groups vary considerably in their need for structure (Hunt 1970) and in their cohesiveness (Thelen 1967), the teacher cannot behave mechanically but must "read" the students' social and academic behavior and provide the assistance that keeps the inquiry moving.

The research underlying this model consists in part of tests of the

social family thesis that cooperative activity generates synergistic energy that advances learning. This type of research also directly tests the thesis of the model itself--that group investigation builds democratic process skills; increases social cohesion; and results in the learning of information, concepts, and the processes of academic inquiry.

Three recent lines of work are pertinent. One is that of Johnson et al. (1981), who have studied the effects of cooperative reward structures on learning. They reviewed 122 investigations in which cooperative and competitive goal structures were compared over a variety of learning activities. Their conclusion was that cooperative goal structures generally increase learning, especially when the learning tasks require coordinated effort. Their work on peer-teaching-peers (Johnson and Johnson 1974) provided information about the effects of cooperative behavior on traditional learning tasks and on values and intergroup behavior and attitudes.

Slavin (1983) has developed a pattern of research in which cooperative goal and task structures are manipulated. Like the Johnsons, he concluded that cooperative structures generate energy that is translated into greater achievement and cooperative behavior. Slavin's extensive review reports on a variety of approaches where he manipulates the complexity of the social tasks and experiments with various types of grouping. He reported success in both academic learning and intergroup relations when heterogeneous groups carried out tasks requiring coordinated effort by group members.

Sharan, Heitz, and Lazarowitz (1980) reported on a series of investigations of the group investigation model itself. They trained teachers to use the model and thus were able to study the effects of different degrees of implementation. Results showed the stronger the implementation, the greater the effects on both lower-order and higher-order academic learning, with the largest effects, as predicted, on higher-order

outcomes. The teachers' students also learned the skills required by the model, and group cohesion and intergroup attitudes were affected positively. Through their careful study of implementation, Sharan and his associates documented the need for extensive training and for the formation of a community of teachers who could help one another perfect their use of this complex model. The research also demonstrated that some very ordinary teachers can learn to use it effectively when adequate training is provided.

Information-Processing Models

Advanced Organizers. The formulation that there would be greater retention of materials from presentations and reading if the material were accompanied by organizing ideas has generated more than 200 studies. However, generating effective organizers turned out to be difficult. Because of this and because of mixed findings, some reviewers asserted that this line of inquiry was not paying off (Barnes and Clausen 1973). Advocates responded with some careful research, and current reviewers are quite enthusiastic (Luiten, Ames, and Ackerson 1980).

Advanced organizers appear to have some limited effects in short-term studies but greater effects in long-term ones. They are effective across ages, being somewhat more effective for students at the stage of concrete operations, and across subject matter. Advanced organizers have twice the effect if they are illustrated and are more effective when they lead to activities and generalizations. While they affect several kinds of outcomes, recall of facts and formulas is most affected.

The prediction is that teachers who accompany presentations and written assignments with organizers will have consistent, although somewhat modest, effects on the students' ability to learn information and concepts. Because readings and lectures repeatedly reach so many learners, the

cumulative potential is great.

The major teaching skills required by this method are cognitive. To frame organizers, the teacher needs to study the material carefully and generate ideas that can provide the learner with a clear sense of the material to be learned. The formulation of the organizers is difficult, as indicated by the modest results in much of the early research, but improved guidelines have recently emerged. The presentation of organizers is not difficult, and the time necessary to prepare illustrations with appropriate media appears to be warranted by the improvement in student learning.

Memory Model. Research on how to teach so that students will remember what they are taught has been conducted for many years. Atkinson began a productive line of work at Stanford University, and Pressley and Levin continued to develop it at the Universities of Western Ontario and Wisconsin. The system they developed is now known as the "link-word" method.

Atkinson (1975) developed the method during experiments with computer-assisted instruction. He was attempting to find effective methods of using computer-mediated learning tasks to increase students' learning of initial foreign language vocabularies. He began to experiment with what he called "acoustic" and "imagery" links. The acoustic link was designed to help students make associations between foreign pronunciations and the sounds of known English words. The imagery link was used to make the connection vivid. Atkinson presented Spanish and Russian words, their pronunciations, and the links to the students and then compared the student achievement results with results of students who were taught by other methods. In one study, the link method produced as much student learning in two trials as the conventional method did in three. The experimental group learned about 50 percent more words than the control group and maintained the advantage over several weeks. Atkinson also found that the method was enhanced when the

students supplied their own imagery.

Pressley and Levin (1978) asked whether or not a student's ability to develop elaborate methods for memorizing material was related to age and practice. They found little correlation between these variables. However, the better students developed more elaborate methods of memorizing than the majority of students, who used rote-rehearsal methods alone. Hence, it appears that most people have to be taught the method or an equivalent one.

Using a link-word method in Spanish vocabulary learning, children in grades two and five learned about twice as many words as did children using rote and rehearsal methods (Pressley 1977). In later research Pressley, Miller, and Levin (1981) employed a "pictured action" variant of the method with first- and sixth-grade children, who acquired three times as much vocabulary as did control groups. Pressley and Dennis-Rounds (1980) extended the strategy to social studies information (products and cities) and learned that, with instruction, students could transfer the method to other learning tasks.

Pressley, Levin, and McCormick (1980) found that primary school students could generate sentences to enhance memorization. Memorization was three times as great for the experimental group than for students using their own methods. Pressley, Levin, and Miller (1981) successfully extended their research to student acquisition of vocabulary with abstract meanings. Levin, Shuberg, and Berry (1983) extended the application to abstract prose.

The consistency of the findings is impressive. The link-word method appears to have general applicability across subject matters and ages of children (Pressley, Levin, and Delaney 1982). Furthermore, research has indicated that teachers can use the method effectively and children can learn it easily.

The teacher skills required to use the link-word method with students

are largely cognitive. Generating the links is the chief cognitive activity. Once the links have been generated and the materials prepared, the teacher can easily present them to the students, whether through worksheets, computer, media, or verbal presentation. It is important to understand that the method does not consist simply of illustrating points with pictures or enactments. Making the links and using word and image association are what count.

Scientific Process, Inductive Thinking, and Inquiry Training. Researchers have developed numerous teaching strategies to explore whether children can learn scientific methods. Models taken directly from the sciences have been the basis for both elementary and high school curricula. A description of the teaching skills and the effects of the science-based curricula is included in a later section of this paper. Research findings indicate that the scientific method can be taught and has positive effects on the acquisition of information, concepts, and attitudes.

Narrowly-defined studies have examined inductive teaching and inquiry training. Worthen (1968) provided evidence to support one of the method's central theses--that induced concepts would facilitate long-term recall. Feeley (1972) reviewed the social science studies and reported that differences in terminology hampered the accumulation of research but that the inductive methods generally live up to expectations, generating concept development and positive attitudes.

Research on Suchman's (1964) model for teaching causal reasoning directly supported the proposition that inquiry training can be employed with both elementary and high school students. Schlenker (1976) reported that inquiry training resulted in increased understanding of science, greater productivity in critical thinking, and better skills for obtaining and analyzing information. He reported that the method made little difference in

the mastery of information per se, but that it was as efficient as didactic methods or the didactic cum laboratory methods generally employed to teach science. Ivany (1969) and Collins (1969) examined variants in the kinds of confrontations and materials used and reported that the strength of the confrontation as a stimulus to inquiry was important and that richness in instructional materials was a significant factor. Elefant (1980) successfully carried out the strategy with deaf children in an intriguing study that has implications for work with all students. Voss (1982) reviews a variety of studies that are generally supportive of the approach.

The skills needed for these models apparently require intensive training. Teachers need to study the substance of a lesson, unit, or curriculum and develop a rich array of instructional materials that students can explore. Teachers have to guide students in concept formation activities and help them become more sophisticated in making categories and inferences. The flow of instruction emerges through the thinking of the students, and the environment has to be adjusted to the developing lesson. Knowledge of both the substance and process appears to be critical.

Personal Models

Student-centered models are numerous and controversial. From a scientific point of view it is unfortunate that the literature is so rhetorical and that so many supporters of personal models have devoted energy to diatribes against traditional methods or even against the work of theorists of other persuasions. Only in the last ten years has considerable energy been devoted to exploring the dynamics of these methods in school settings and to dealing directly with the major concern of their critics--that person-centered education may neglect the development of academic outcomes. An older study which avoided these problems is the

Eight-Year Study by Chamberlin and Chamberlin (1942). In Freedom to Learn in the 80's, Carl Rogers (1983) includes a chapter summarizing much of the research from the humanistic perspective.

The separation of personal models from theory-driven lines of research is also clearly apparent. Cross-model analysis probably would be beneficial for persons from very different schools of thought. For example, social psychologists and behavioral therapists frequently seek and often achieve similar goals.

Aspy and Roebuck have been very productive in the study of personal models. Over the last fifteen years they have explored several of the theses of the personal family of models, particularly the thesis that degrees of student-centered teaching (especially building self-directed, empathetic communities of learners) will have positive effects on students' feelings about themselves and others and, consequently, will free energy for learning. The Roebuck, Buhler, and Aspy (1976) study, which employed the method with students identified as having learning difficulties, produced positive effects on self-concept, intergroup attitudes and interaction patterns, achievement in reading and mathematics, and increased scores on intelligence tests. In studies of classroom teachers, Aspy et al. (1974) documented the need for extensive training. The students of teachers who had a thorough understanding of the model achieved more, felt better about themselves, had better attendance records, and improved their interpersonal skills.

The model of nondirective teaching is very complex. Teachers have to develop egalitarian relationships with their students; encourage students to be cooperative and to respect differences in personality and ability; help students develop programs of study, including goals and the means for achieving them; provide feedback about performance and behavior; teach students to reflect on peer behavior and performance; help individuals and

groups evaluate progress; and maintain an affirmative social climate.

We think that the researchers from the personalistic school of thought have answered their critics and have developed a teachable technology. That technology requires a thorough knowledge of the theory of the approach and how to use it in the development of the educational environment. Because more than "ordinary" behaviors are necessary to implement the personal models, extensive training and practice are required.

Behavioral Systems Models

This line of inquiry, based on the work of Skinner and the cybernetic training psychologists, has the largest literature. Studies range from programmed instruction to simulations, and include training models (Joyce and Showers 1983) and methods derived directly from therapy (Wolpe, 1969). There is a great deal of research on the application of social learning theory to instruction (Becker 1977), training (Smith and Smith 1969), and simulations (Boocock and Schild 1968).

The behavioral technologists have demonstrated that they can design programs for both specific and general goals (Becker 1977) and also that the effective application of those techniques requires extensive cognitive activity and precise interactive skills (Spaulding 1970).

Summary: Theory-Driven Studies

Have the developers of theory-driven methods proved that they can design effective approaches to teaching? We think they have.

What is the nature of the skills thus generated? We think that the cognitive and interactive aspects are intertwined. Effective implementation requires a thorough understanding of theory and an ability to acquire skills that the average person or teacher rarely have. With modification, most of

the skills have applicability across subject and grade lines, although some have been developed for particular purposes.

Does the application of the theory-driven models endanger the traditional goals of the school? By no means. On the contrary, nearly all the theory-driven approaches increase student learning.

Research on Curriculum

In order to establish the relationship between curriculum research and teaching skills, numerous questions have to be answered. Has it been demonstrated that there is a technology of curriculum development which produces curriculum plans and affects student learning? Can faculties learn to use them? Can conditions be developed in schools that make it possible to stabilize the curricula so that they can have effects? If the answers to these questions are affirmative, then teaching skills derived from formulations of curriculum can legitimately be employed as the objectives of teacher education.

Currently the clearest evidence comes from the study of the academically oriented science and mathematics curricula developed and implemented from 1955 to 1975, and from the experiments with elementary curricula in a variety of subject areas (Becker 1977; Rhine 1981).

The theory of the academic curricula is relatively straightforward. The essence of the position was stated in The Process of Education (Bruner 1960) and in The Teaching of Science (Schwab and Brandwein 1962). The teaching of science should simulate as much as possible the scientific process itself. The concepts of the disciplines should be studied rigorously in relation to their knowledge base. Thus, science would be learned as a process of inquiry. Furthermore, retention of information would improve because it would be embedded in a meaningful framework and because the

student would possess the interrelated concepts that make up the structure of the disciplines.

Elaborate curriculum materials were prepared to support the teaching/learning activities. The evaluation of the curricula was difficult because implementation was more arduous than had initially been thought. Only partial implementation occurred in many settings (Fullan and Pomfret 1977).

In the early stages research was meager and evaluation was poorly funded. Eventually, however, several studies were completed in sites with fairly high levels of implementation; and meta-analyses, such as that by Glass (1978), have recently examined the conclusions from large numbers of studies.

El-Nemr (1979) concentrated on the teaching of biology as inquiry (Schwab 1965) in high schools and colleges. El-Nemr looked at the effects of information on achievement, on the development of process skills, and on attitudes toward science. The experimentally oriented biology curricula achieved positive effects on all three outcomes. The average effect sizes were largest for process skills (.44 at the high school level and .62 at the college level). For achievement they were .27 and .11, respectively, and for attitudes, .22 and .51, respectively.

Bredderman (1981) analyzed a broader range of science programs and included the elementary grades. He also reported positive effects and, in addition, reported effects on intelligence tests when they were included.

From these and other studies we can conclude that it is possible to develop curricula that will achieve model-relevant effects and increase the students' ability to learn information and concepts. Also, vigorous curricula in one area appear to stimulate growth in other apparently unconnected areas. For example, Smith's (1980) analysis of the influence of

curricula in aesthetics shows that the implementation of the arts-oriented curricula was accompanied by gains in the basic skills areas. It is possible that an active and effective curriculum in one area has energizing effects on the entire school climate.

Evidence from curricula in science and several other subject areas indicates that curricula which increase student learning can be constructed. They also can be implemented, although not as easily as was believed 20 years ago.

The nature of the skills required by the curriculum approach is a blend of the interactive and the intellectual. It may require a high degree of skill in a variety of teaching models. (See the description of skills given above in the review of theory-driven research.) It may also require mastery of an academic discipline. Fullan (1982) argued persuasively that implementation requires a "deep" understanding of the curriculum itself--its rationale, process, structure, and materials. There is little question that in this case "skill" refers to a type of behavior that requires specialized knowledge and that demands extensive training and practice. An advantage is that once a curriculum has been thoroughly developed and carefully researched, the skills are explicitly derived and thus are available to guide training and practice. The evaluation process can also identify skills that teachers derive as they use the curricula and that make their teaching more effective. For example, Stallings (1975) investigated this point by using process observation during the study of the Follow Through curricula.

How do we interpret this body of work for the selection of teaching skills? There are many possible curricula. Many of them are effective if they are used properly. Should teachers learn to use all of them? We think not. The amount of time required for training would be prohibitive.

At the preservice level, what may be most important is the teacher's

ability to learn skills for mastering curricula implementation. Having competence in a few skills that are likely to be highly relevant to the beginning teacher may be useful, but the more important training may involve the acquisition of the skills related to knowing what is necessary to implement curricula to bring them to life in the classroom. If the teacher develops these skills in the early phase of training, then inservice education can build on these general skills and concentrate on developing the specific skills needed to implement the actual curricula used in a teacher's school and school district.

It is clear that the skills needed to use research-based curricula meet the qualifications of the most demanding dictionary definitions of "skill." Most people, including experienced teachers, can not acquire them without extensive training and practice. However, teachers can learn them when given extensive training and a strong training model (Joyce and Showers 1983). To adapt and apply them to school settings requires great intellectual effort and the continuous application of professional judgment.

Spaulding's (1970) study asked whether teachers would be able to implement a curriculum based on several theory-driven models of teaching well enough to achieve both general and model-relevant effects. The curriculum was designed for low-income, socially-disruptive, low-achieving elementary school students. It required teachers to master four teaching models and employ them selectively to achieve a complex set of goals. Social learning theory was employed to induce independent learning and socially integrative behavior. Inductive instructional methods were moderated by a cognitive-development frame of reference to organize the learning tasks. The teachers had to comprehend and use social learning theory, inductive theory, and Piagetian cognitive psychology. Over a three-year period the students of these teachers achieved greater personal control, integrative behavior, and

academic achievement. Measures of intelligence indicated that students responded to the treatment in this area as well.

Spaulding's work underlines the skills needed to implement a complex, theory-driven curriculum. The teachers had to be able to employ several theoretical frameworks. They had to be able to discern the students' levels of independence, social integration, achievement, and cognitive development. They had to be able to teach inductively; to help students gather, categorize, and label sets of data; and to modify the induction processes in accord with the students' characteristics. Spaulding demonstrated that the teachers could acquire those skills and use them well enough to reach a variety of goals. Unless teachers acquire these kinds of skills, coherent school curricula are unlikely. The demonstrable impact of the carefully developed curricula warrants their importance.

Research on Effective Schools

The message from this line of research is that one dimension of teaching (and administering) is the ability to create environments which extend beyond the limits of the individual classroom to influence the environment of the school as a whole. The data base is new but promising. The first step is to learn how some schools achieve above-average effects. The second is to learn how faculties, operating as a unit, can create energizing environments at the school level. Training to instill behaviors that bring about these effects will compete for a place in preservice and inservice programs.

Many recent studies in the effective school approach have oriented their search around the earlier findings of Brookover et al. (1978) and Rutter et al. (1979). The result has been a body of studies that confirm many of the early results, which is useful because it suggests that the

differences that do exist among schools are, in fact, systematic. However, it is quite possible that there could be improvement in the definition of the variables or that other variables would emerge as factors if they were studied differently. Also, very little research has been oriented to the potentially relevant concepts available from social psychology and organizational theory. Inclusion of these frames of reference might be worthwhile.

Currently, the findings fall into the following categories:

1) school learning climate, including expectations and standards, clarity of mission, curricular organization, the monitoring of student progress, the reward structure, connectedness with the parents, and the provision of opportunities to learn; 2) school social climate, including a sense of community, student involvement in governance, orientation of the peer group, and provisions for orderliness and safety; 3) the administrator's role, including the development of active instructional leadership; and 4) the school's organizational climate, including development of collaborative decision making.

Although this line of inquiry has a "soft focus" on the teacher behaviors that produce the conditions believed to be associated with effective school climates, we believe that such research has to be taken seriously for a number of reasons. One is the size of the unit in question. Although the effects are often small, the number of students affected is very large. Second is the potential for interaction between school climate and many of the behaviors identified in the other lines of research. The power of curriculum and teaching may well be magnified by school climate. Third, some of the conditions described in this research are very similar to those described by the other lines. The production of an orderly, affirmative climate with clearly articulated goals and curriculum is an example.

Finally, the implementation of the skills derived from the other lines of research may well depend on the organizational factors identified in the studies of effective schools.

The theory-driven lines can provide direct assistance in defining relevant skills more clearly. The social and behavioral theories certainly promise methods for building social systems, methods that can be incorporated into preservice and inservice programs.

Clearly, the study of how to build effective school climates needs to be undertaken to define the relevant teachable skills. Progress may be made relatively quickly if the current literatures on educational change (Fullan 1982) and training (Joyce and Showers 1983) are brought to bear. It may be that much of the skill needed to improve the educational climate may lie in managing educational change and in learning new teaching skills.

For the present, the skills of working cooperatively to select the missions of the school and to devise ways to create orderly yet stimulating environments appear to be essential. These skills are manifested in the teacher's role as a faculty member rather than in the teacher's role as an instructor.

Assessing the Base

We are encouraged by our analysis. All four lines of inquiry are promising. Each has generated descriptions of teaching skills that have potential as definitions of professional behavior and, thus, as objectives of teacher education.

The skills range from "good practices" that will get effects but require little training, to practices that require complex knowledge and interactive skills acquired only through extensive training and long-term practice.

The naturalistic studies identify practices that promise to improve classroom teaching by a series of small but significant modifications of normal practices. Some of these improvements can be made with little training, but others require more extensive training. A few of the important ones--like carrying on instruction or "lesson development"--require further definition.

The theory-driven line has produced descriptions of complex skills in both the cognitive and interactive domains of teaching. These have great promise for increasing the effects of instruction, but they often require extensive training and practice. While some models have very specific effects on students, such as the development of skills for analyzing social issues, many increase the general effects of schooling. Nondirective, cooperative, and inductive methods generally increase student learning of information and concepts. They also achieve the particular objectives toward which they are directed, such as improvement in attitudes toward self, intergroup relation, and the process skills derived from scientific inquiry.

Curriculum research has achieved very large effects in some cases. The skills research has identified include mastery of both the academic

substance and the theory of the curriculum, along with the interactive skills and logistical ability to implement the curriculum. Extensive training and practice are required to acquire these skills.

The research on effective schools concentrates on the skills required for teachers to work together as a faculty to create productive social climates. The skills necessary for creating an effective school are very complex and include social process skills, the ability to think through the mission of the school, and the skills necessary to create and implement strong and coherent curricula. In addition, it appears that school improvement depends greatly on the faculty's ability to create conditions conducive to productive innovation, including the proper conditions for intensive and extensive self-training (Joyce and Showers 1983; Showers 1984). In addition, the leadership skills identified by Fullan (1982) and Leithwood and Montgomery (1983) are required of the administrative staff.

The important question is whether the base of research is sufficient to define many of the objectives of preservice programs in terms of the skills defined by these types of research. We think it is. Similarly, we believe that the base is strong enough to support inservice programs designed to 1) enable teachers to acquire and use these skills, 2) generate a school climate that increases learning, and 3) increase the likelihood that tested innovations can be implemented in educational settings.

Most of the skills that emerge from the research are generic; that is, with modification they are applicable across grades, subjects, and educational settings (learning centers, resource-based programs, and classrooms).

Figure One provides a schematic for assembling the identified skills for preservice and inservice application. Each line of inquiry has contributed something to our understanding of the skills in each of the five

categories.

Instructional management skills refer to the behaviors that stabilize the instructional situation and induce students to stay busy with tasks that are monitored and adjusted to their progress.

The teaching strategies or models category requires skills that enable the teacher to use research-based educational environments to increase learning of various kinds.

Curriculum skills are those required to implement research-based curricula in schools so that academic substance and instructional process are coherently organized and have a cumulative impact.

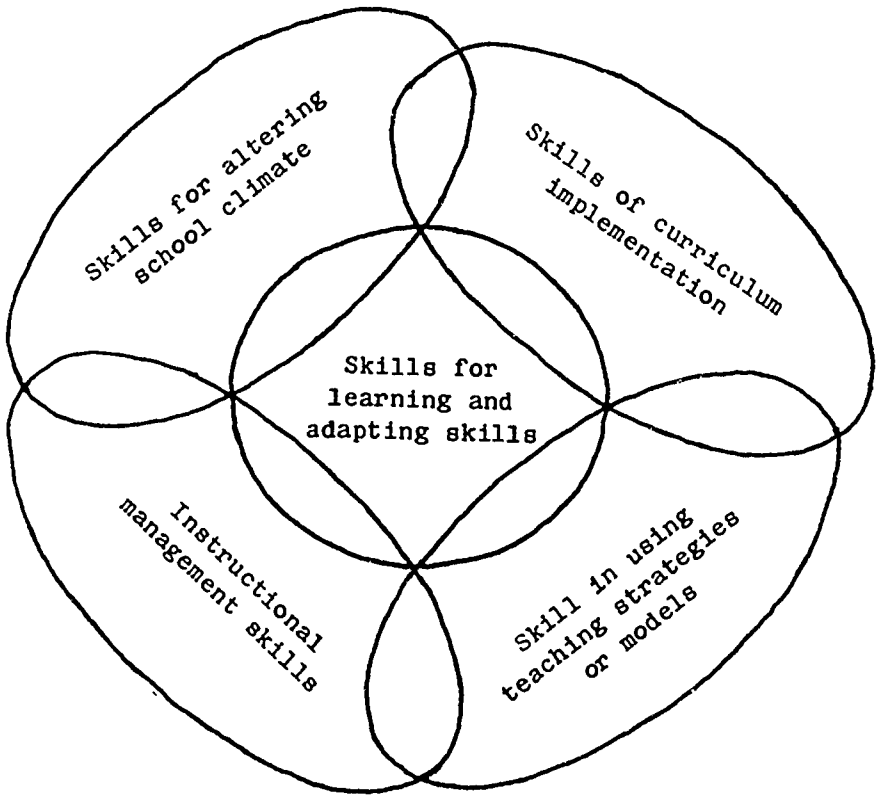
School climate skills are those required to create an educational community where the social organization generates energy and rewards individual and collective effort toward cooperation and excellence in achievement.

The skill needed to acquire and adapt new skills may well be most important. The research from all four lines of inquiry, especially from models of teaching, curriculum, and school improvement, indicates that the teacher has to have the ability to acquire new teaching skills and to create a climate in the school that is favorable to innovation. Research indicates that developing these types of skills requires extensive training.

All the skills identified by the research require modifications in present practice. Learning how to learn may well be the key skill--the one that unlocks the door to using research to improve school practice.

FIGURE ONE

Categories of Teaching Skills



Derived from research

Naturalistic Studies of Teachers
Naturalistic Studies of Schools
Theory-Driven Experimental Studies of Teaching
Curriculum Studies

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